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|  | **Unit 1: Biochemistry** | | | | | | | |
| Name: | | Start Date: | | | 08/28/17 |  |  |  |
|  | | Test 1 Date: | | | 09/25/17 |  |  |  |
| Period: | | Teacher: Ms. Jost | | | |  |  |  |
|  | |  |  |  |  |  |  |  |
| **BIOCHEMISTRY** | | Submitted | Resubmit | Correct | Evidence of Learning | Page # | Date | Sign-Off |
| **Objective 1:** Compare the structures & functions of the major biological molecules, organic and inorganic, as related to the survival of organisms | |  |  |  | **Catalyst: What did you eat for breakfast?**  **Activity: Meal Prep**  **HW: Breakfast Research & Reflection** | 4 |  |  |
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|  |  |  | **Catalyst: Subject Sort**  **Activity: Chemistry of Carbs, Lipids, Proteins** | -- |  |
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**Unit 1: BioChemistry**

Start Date: 08/28/17

Test 1 Date: 09/25/17

**Objective 1:** Compare the structures and functions of the major biological molecules, organic and inorganic, as related to the survival of organisms.

*Essential Question:* What are the subunits and functions of the four major groups of organic molecules?

*Essential Question:* What are the properties of water?

*“I Can” Statements:*

* Compare and contrast the four major organic macromolecule groups in terms of:
  + The formative elements
  + The formative subunits (monomers)
  + Functions within the cell/organism
  + Where found in the diet (food sources)
* Describe the major properties of water and explain the importance of these properties in the context of sustaining life:
  + Universal solvent
  + High specific heat
  + Adhesion and cohesion
  + Capillary action
  + Density

**Objective 2:**  Explain how enzymes act as catalysts for biological reactions.

*Essential Question:* How and why do enzymes catalyze biological reactions?

*“I Can” Statements:*

* Demonstrate the link between shape and function as it relates to an enzyme-substrate complex, as well as the effects of environmental factors (temperature, pH) on enzyme efficiency
* Develop a cause-and-effect model for specificity of enzymes

**Vocabulary**

* Activation Energy
* Adhesion
* Amino Acid
* Capillary Action
* Carbohydrate
* Catalyst
* Cohesion
* Denature
* DNA
* Density
* Enzyme
* Fatty Acid
* Hormone
* Inorganic
* Lipid
* Macromolecule
* Monomer
* Monosaccharide
* Nucleic Acid
* Nucleotide
* Organic
* Peptide Bond
* Polarity
* Polymer
* Polysaccharide
* Product
* Protein
* Reactant
* RNA
* Solvent
* Solute
* Substrate

**Notes: Biomolecules (Organic) Organic=**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Biomolecule** | **Found in** | **Elements & Subunit (Monomer)** | **Structure** | **Functions** | **Examples** |
| Carbohydrates |  | Elements:  Monomer: |  |  |  |
| Lipid |  | Elements:  Monomer: |  |  |  |
| Proteins |  | Elements:  Monomer: |  |  |  |
| Nucleic Acids |  | Elements:  Monomer: |  |  |  |

**Catalyst: What did you have for breakfast? Please be specific as possible in your description, include how much of each food you had.**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Homework**

Fill out the nutrition chart for your breakfast. You may read the nutrition label of the product or use the following websites as resources: <https://ndb.nal.usda.gov/ndb/search>

<http://nutritiondata.self.com/>

(Add line below the chart if needed)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of Food** | **Serving Size** | **Servings per Container** | **Calories per serving?** | **Grams of fat per serving?** | **Grams of protein per serving?** | **Grams of carbohydrates per serving?** | **Most prevalent: carbohydrates, lipids, or protein?** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
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**Reflection: Are you eating enough for breakfast? Are you eating the right stuff for breakfast? Defend your answer.**

**Catalyst: Breakfast Counsel**

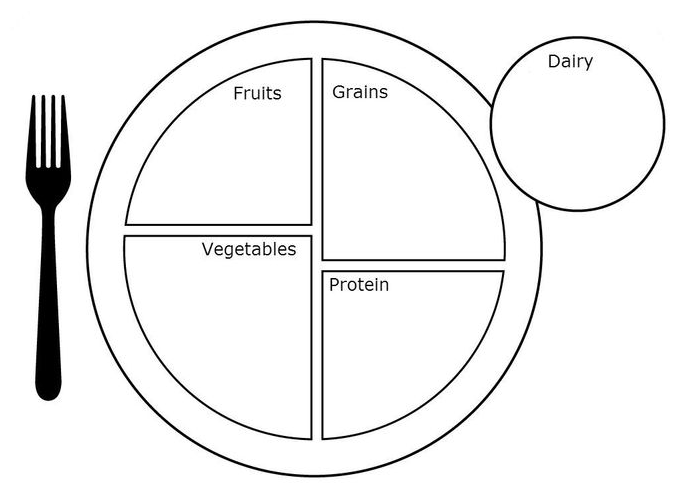
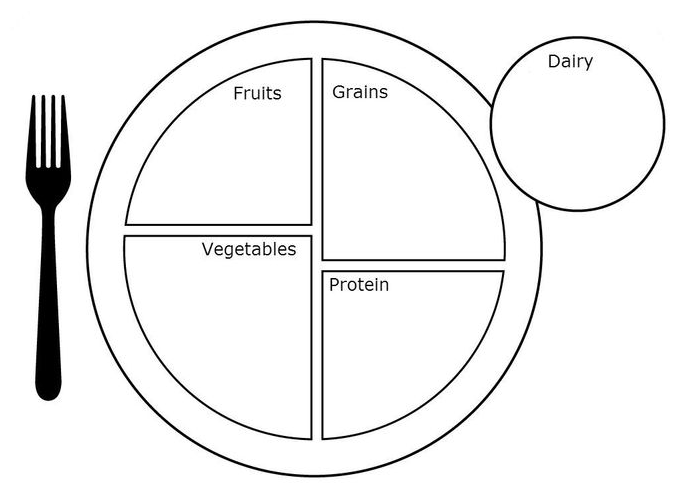
**Based on what you know about nutrition and biomolecules, provide advice for the following two students as to what they should be eating for breakfast.**

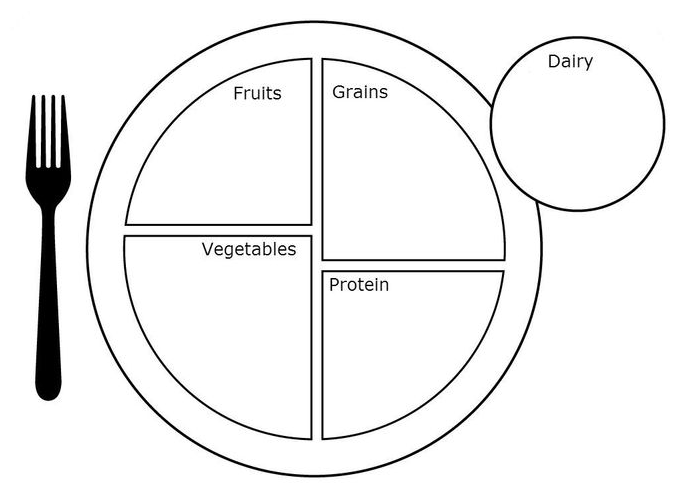
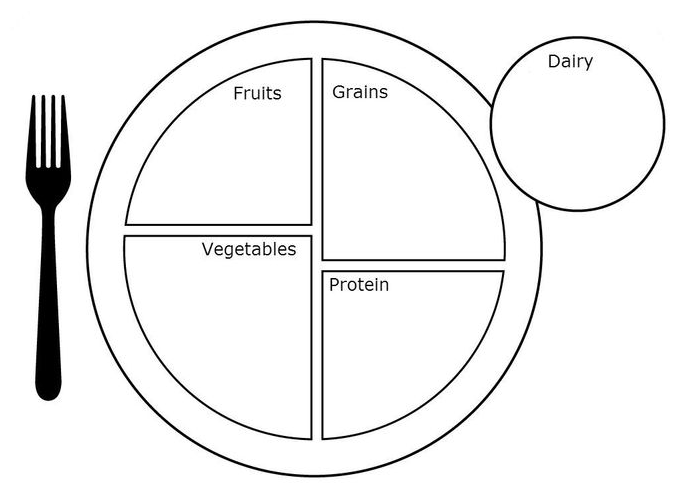
1. Jordan is an all-star athlete on the WLPCS basketball team. At 6’6 his body needs a lot of fuel and his coach keeps encouraging him to bulk up a little to be more competitive in the paint. Jordan typically eats a Poptart for breakfast and has recently begun eating two every morning thinking that the extra calories is all he needs to help him gain more muscle. Why is this not the best breakfast for Jordan? What should he be eating?

2. Sarah is simply not a morning person and always snoozes her alarm multiple times, often making her late to school. Since she is always running late she rarely has time for breakfast. Lately, Sarah has been really struggling in her alpha period, she often feels irritable and is struggling to understand the material. Why is it important for her to eat breakfast? What should she be eating for breakfast? (Brainstorm some foods she can easily grab on the go and eat on her way to class.

**Activity: Meal Prep**

You and your team are in charge of designing a healthy, balanced meal plan for 11th grade students. With your team you will design a sample menu for a day that includes a balanced portion of the 5 major food groups: Fruit, Vegetables, Protein, Dairy, Grains. After you have completed your menu, count how many servings\* of each food group you have and fill in the chart at the bottom of the page. Use your own diet and eating habits to inspire your menu, but remember you can only eat so much in one sitting so include no more than 4 items per meal.

******Breakfast Lunch**

**Snack Dinner**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Food Group | Fruits | Vegetables | Protein | Grains | Dairy |
| Total Daily Serving |  |  |  |  |  |

\*serving size depends on the items but for this exercise assume 1 serving= 1 cup, oz, or slice

**Activity: Meal Plan**

Now that you’ve made your meal plan, let’s see how it compares to the recommended serving as published by the United State Department of Agriculture (USDA).





**Vegetables**

**Protein**

**Grains**

**Fruits**

**Dairy**

**Extras (Sweets, Fats, ect.)**

Recommended Daily Calorie Intake:

Recommended Daily Calorie Intake:

Reflection

1. Based on this information, how does your group’s meal plan compare? What food do you need to include more of? Less of?

2. Thinking about your own eating habits, is there anything you need to do to make sure your diet is more balanced?

Lab: Food Labels Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

**Objective 1:** Compare the structures and functions of the major biological molecules, organic and inorganic, as related to the survival of organisms.

**Background Information**

In 1992, the United States Department of Agriculture created the Food Pyramid as a way of visually representing recommended portions of each food group. This pyramid was modified in 2005. The current pyramid divides foods into six categories: grains, vegetables, fruits, milk, meats & beans, and oils & sweets. The USDA recommends that an adult consumes daily 6 oz. of grains, 2 ½ cups of vegetables, 2 cups of fruit, 3 cups of milk, and 5 ½ oz. of meat & beans. Oils & sweets should be consumed in moderation.

What nutrients are present in each of the six food groups? In this laboratory activity, you are going to investigate the nutrients present in each food group.

Begin this activity by reading the article titled “Nutrition Fact Sheet: Clearing Up Calorie Confusion” published by the American Dietetic Association.

**Article: Nutrition Fact Sheet: Clearing Up Calorie Confusion**

With so many different messages about how to lose weight, consumers are most interested in the most successful solutions. The key to any successful, healthy weight-loss strategy comes down to managing calories – making sure you eat fewer and/or burn more. But, since calorie counting can be challenging for some of us, some simple tips can make it a bit easier.

It’s all about calorie balance. That means if you eat more calories than your body uses, they will be stored as fat. One pound of body fat is equal to 3,500 calories. For example, eating 500 fewer calories per day would result in losing one pound per week. Of course, every “body” is different, so you may find that your weight loss can vary from week to week.

*Portion Management*

To keep calories in check, be mindful about the amount of food you eat on each occasion at breakfast, lunch, dinner, and snacks. You may still enjoy your favorite foods, just in moderation. To do this, you need to be aware of portion sizes and choose the amount that’s right for you.

Research suggests that we eat in “units,” such as a sandwich, a plate of food, or a slice of pizza – but today’s units come in varying sizes. Of course, the bigger the portion, the more calories you’re eating – and this is where the nutrition label can be a useful tool. Use the label to determine the amount of calories and nutrients per serving so you can keep track of how much you’re eating. When dining out, some tips to managing portions are:

* Request a half order of an entrée. Have it served on a salad plate rather than a large dinner plate.
* Share an entrée with a friend.
* Ask about child-sized portions.
* Get a “to-go” box when you are served and put half the meal into it before you start to eat.
* Order an appetizer as an entrée.

*Go Ahead and Snack*

It’s a smart strategy to incorporate your favorite “fun foods,” just do so in moderation. Divide larger packages into smaller portions or choose foods in pre-proportioned single-serving packages. Look for snacks such as fat-free yogurt, fruit cups, crackers, reduced fat cookies or cheese that provide about 100 to 150 calories per package.

*Jot it Down*

To get an idea of how much you’re eating, try keeping a food diary for a few days. Jot down everything you eat and drink, including the portion size. This will help you spot those “hidden” calories that seem to sneak in.

People tend to underestimate how much they eat. To help you get a perspective on your portion sizes, read food labels to see what is listed as the serving size. To get an idea of what serving sizes look like, use measuring cups to portion out one serving. Do this a few times for foods you eat frequently and soon you’ll be able to gauge on your own how much you are eating by visual cues.

*Portion Control is in Your Hands*

Judging serving size is a learned skill. For a quick estimate of portion sizes, here are some helpful reminders:

|  |  |  |
| --- | --- | --- |
| **Food** | **Serving Size** | **About the size of…** |
| Meat, Poultry, Fish | 2 – 3 ounces | Deck of cards or palm of your hand |
| Pasta, Rice | ½ cup | Small computer mouse or the size of your fist |
| Cooked vegetables | ½ cup | Small computer mouse |
| Fruit | ½ cup | Small computer mouse or a medium apple, pear, or orange |
| Cheese | 1 ½ ounces hard cheese | C battery or your thumb |

|  |  |
| --- | --- |
| **Easy Ways to Burn 100 Calories –** *Based on a 150 pound person* | |
| **Activity** | **Minutes needed** |
| Gardening | 20 |
| Washing the car | 20 |
| Walking the dog | 20 |
| Pushing a stroller | 20 |
| Bicycling | 25 |
| Aerobic dance | 15 |
| Ice skating, Roller skating | 15 |
| Jogging | 15 |

*Calorie Balance*

Research suggests that subtracting 100 calories a day could go a long way in helping you manage your weight. There are many ways to burn 100 calories through physical activities. It can be as simple as walking your dog around the neighborhood, gardening, or kicking around a soccer ball. Here are some tips for making fitness fun.

*Bottom Line*

Make sure your calories count by choosing a wide variety of healthful foods each day. Be sure to get the nutrients you need by including whole grains; fruits and vegetables; lean meat; low-fat or fat-free dairy foods; and moderate portions of your favorite snacks. Add regular   
physical activity and you’re on your way to a healthy and   
balanced lifestyle.

**PreLab Questions:**

1. Why does the body store fat?   
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. How many calories are in 1 pound of body fat?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What are the recommended serving sizes for meat? Pasta or rice? Fruit?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. The American Dietetic Association thinks that Americans are suffering from an “obesity epidemic.”
   1. What evidence do you have that supports this assertion?   
      \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. What do you think has caused/is causing this problem? Justify your response.   
      \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Propose two solutions to this problem. Justify your solutions in terms of practicality and whether or not the solution could be implemented.   
      \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Food Label Analysis Directions:**

Choose 5 empty food packages and study their labels. Make sure that you find foods that are good sources of protein, lipids, and carbohydrates. Complete the following table about their nutritional information:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of Food** | **Serving Size** | **Servings per Container** | **Calories per serving?** | **Grams of fat per serving?** | **Grams of protein per serving?** | **Grams of carbohydrates per serving?** | **Most prevalent: carbohydrates, lipids, or protein?** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**Food Label Analysis Questions:**

1. Of the foods you tested, which was highest in carbohydrates? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

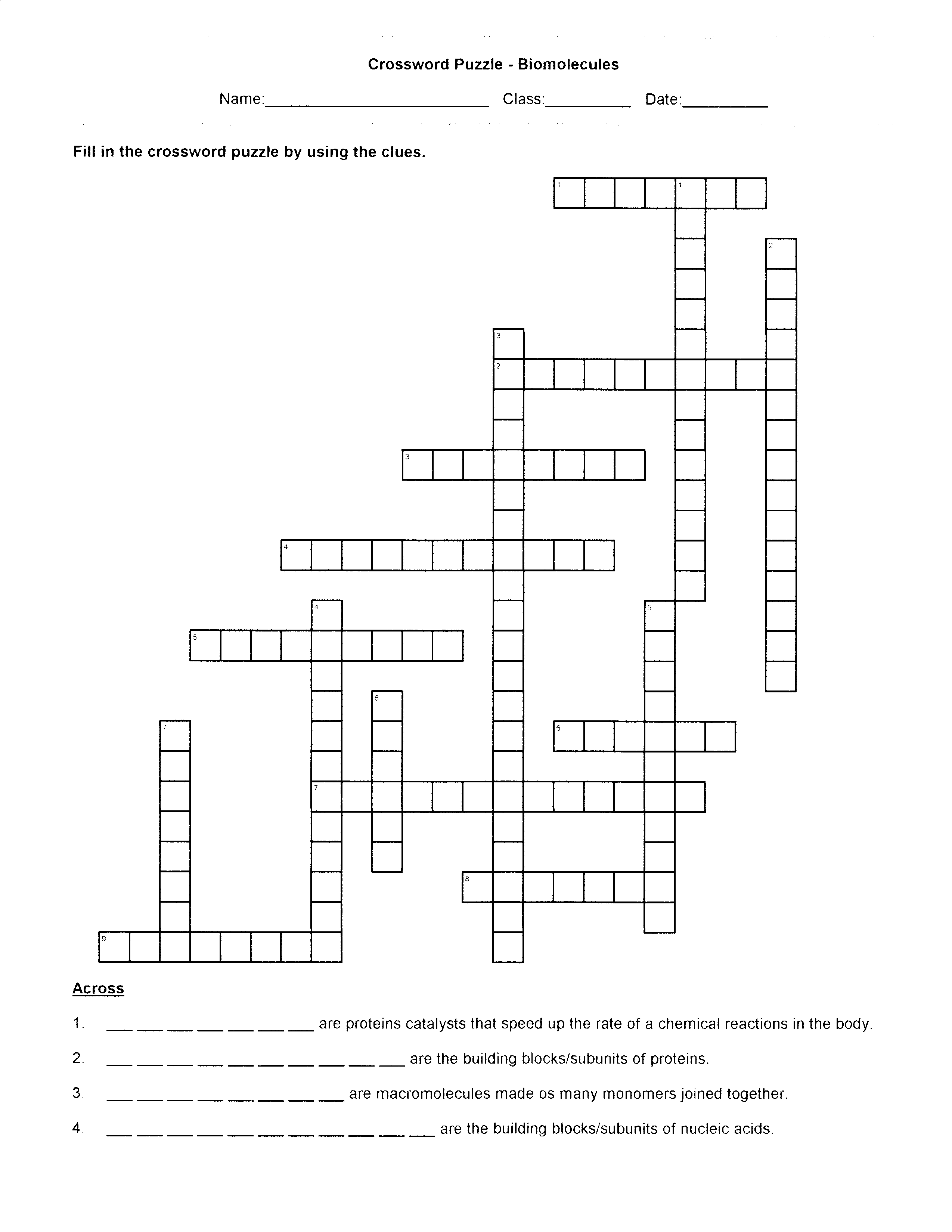
List another food you think would be high in carbohydrates. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

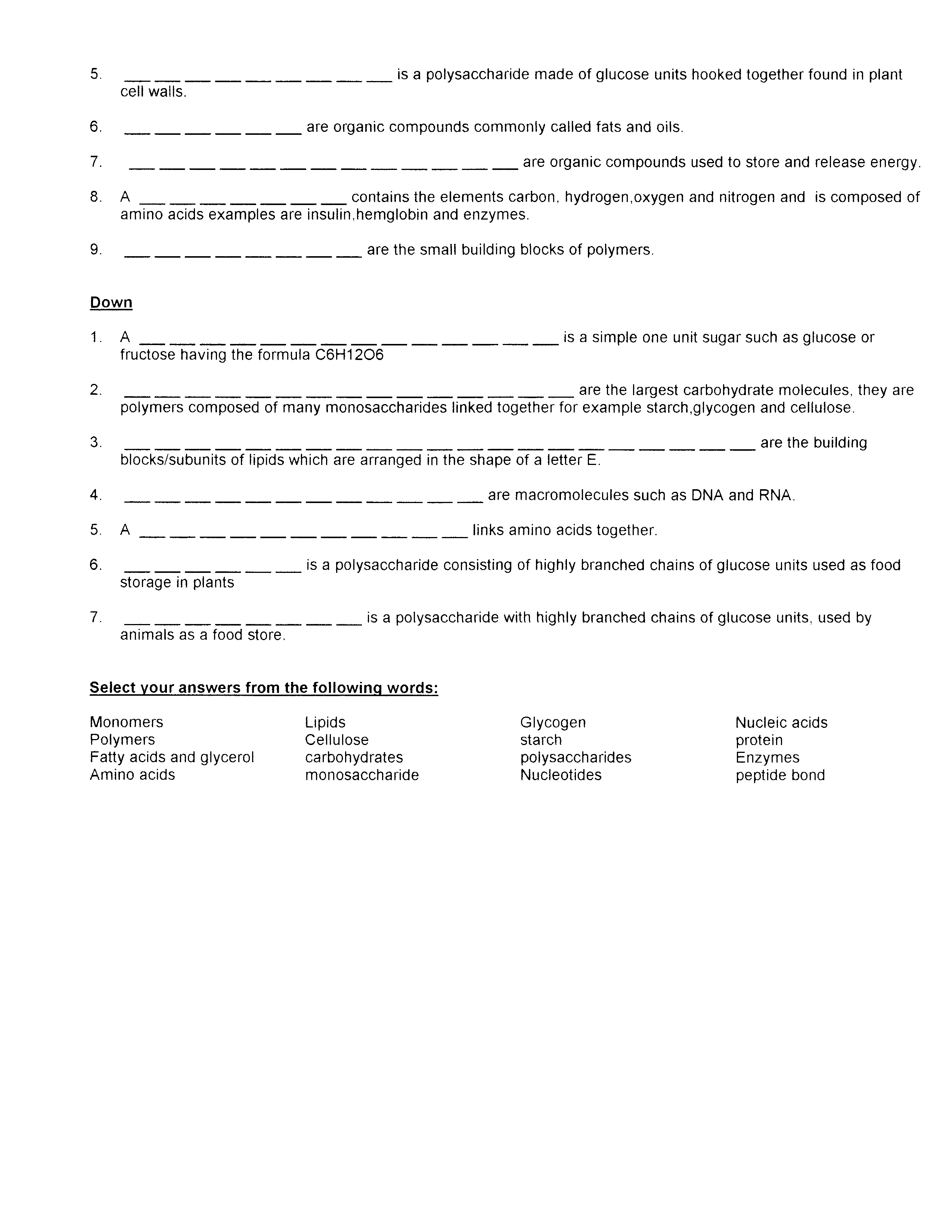
1. Of the foods you tested, which was highest in protein? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

List another food you think would be high in protein. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Of the foods you tested, which was highest in lipids? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

List another food you think would be high in lipids. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_





**Lab: Biomolecules Indicator Food Lab**

Each chemical test described below uses a chemical indicator, distilled water, and a selected substance. If the test is positive, a significant color change will occur due to the indicator coming into contact with the specified biomolecule.

*Chemical Indicators:*

1. Biuret’s Reagent
2. Iodine solution
3. Brown paper towel test
4. Benedict’s solution

*Test Substances:*

1. Lipid (cooking oil)
2. Protein (protein powder)
3. Complex Carbohydrate (starch)
4. Simple Carbohydrate (glucose)

*General Lab Procedure:*

1. Assign each person in your group to one of the following roles. Record their names on the lines:
   1. Responsible for obtaining supplies and directing the group’s activity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Responsible for adding the test substances to the test tubes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Responsible for adding the indicator solutions to the test tubes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Responsible for making observations and recording data in the data table \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. Responsible for cleaning up and washing the test tubes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Obtain test tubes for each substance being tested, one for a control and the others for testing the substance. Place these test tubes in a test tube rack.
   1. Label the 1st test tube “oil.”
   2. Label the 2nd test tube “protein.”
   3. Label the 3rd test tube “starch.”
   4. Label the 4th test tube “glucose.”
   5. Label the 5th test tube “water.”

**Draw a simple sketch of your lab set up:**

***Part A: Biuret’s Reagent test***

***\*\*Note\*\**** Biuret’s reagent is caustic to the skin and clothing. If Biuret is spilled, rinse with soap and water and tell your teacher immediately.

1. Obtain chemical splash goggles and put them on.
2. Choose one person from your group to handle the Biuret’s reagent. That person must obtain gloves from your teacher.
3. Look at the five test tubes in the test tube rack in front of you. Make sure to only pick up one test tube at a time and to place it back in the correct place before handling another test tube.
4. Using a clean pipette, add 1.0 mL of vegetable oil to the test tube labeled “oil.”
5. Using a clean pipette, add 1.0 mL of protein solution to the test tube labeled “protein.”
6. Using a clean pipette, add 1.0 mL of starch solution to the test tube labeled “starch.”
7. Using a clean pipette, add 1.0 mL of glucose solution to the test tube labeled “glucose.”
8. Using a clean pipette, add 1.0 mL of distilled water to the test tube labeled “water.”
9. Add 10 drops of Biuret’s reagent to each test tube. Gently shake each test tube to mix the solutions.
10. Record your observations in the data table below.
11. Dispose of the solutions by flushing them down the drain with copious amounts of water.
12. Use a test tube brush and soapy water to clean the five test tubes and rinse with clean water. Use a paper towel to dry the test tubes as best you can.

***Part B: Paper Towel Test***

1. Obtain a piece of brown paper towel approximately square in shape.
2. Draw five non-overlapping circles on the paper towel. Label each circle with one of the test substances: Oil, Protein, Starch, Glucose, Water.
3. Using a clean pipette, add 1 drop of vegetable oil to the circle labeled “oil.”
4. Using a clean pipette, add 1 drop of protein solution to the circle labeled “protein.”
5. Using a clean pipette, add 1 drop of starch solution to the circle labeled “starch.”
6. Using a clean pipette, add 1 drop of glucose solution to the circle labeled “glucose.”
7. Using a clean pipette, add 1 drop of distilled water to the circle labeled “water.”
8. Hold the paper towel up to the light once the solutions have soaked into the paper towel. Observe whether or not the paper towel is transparent (see-through) or not. Record your observations in the data table below.
9. Dispose of the paper towel in the rubbish bin.

***Part C: Lugol’s Iodine Test***

***\*\*Note\*\**** Iodine can stain skin and clothing. If iodine is spilled, rinse with soap and water and tell your teacher immediately.

1. Look at the five test tubes in the test tube rack in front of you. Make sure to only pick up one test tube at a time and to place it back in the correct place before handling another test tube.
2. Using a clean pipette, add 1.0 mL of vegetable oil to the test tube labeled “oil.”
3. Using a clean pipette, add 1.0 mL of protein solution to the test tube labeled “protein.”
4. Using a clean pipette, add 1.0 mL of starch solution to the test tube labeled “starch.”
5. Using a clean pipette, add 1.0 mL of glucose solution to the test tube labeled “glucose.”
6. Using a clean pipette, add 1.0 mL of distilled water to the test tube labeled “water.”
7. Add 3 drops of Lugol’s Iodine solution to each test tube. Gently shake each test tube to mix the solutions.
8. Record your observations in the data table below.
9. Dispose of the solutions by flushing them down the drain with copious amounts of water.
10. Use a test tube brush and soapy water to clean the five test tubes and rinse with clean water. Use a paper towel to dry the test tubes as best you can.

***Part D: Benedict’s Solution Test***

***\*\*Note\*\**** Benedict’s solution is a skin and eye irritant. If the Benedict’s solution is spilled, rinse with soap and water and tell your teacher immediately.

1. Look at the five test tubes in the test tube rack in front of you. Make sure to only pick up one test tube at a time and to place it back in the correct place before handling another test tube.
2. Using a clean pipette, add 1.0 mL of vegetable oil to the test tube labeled “oil.”
3. Using a clean pipette, add 1.0 mL of protein solution to the test tube labeled “protein.”
4. Using a clean pipette, add 1.0 mL of starch solution to the test tube labeled “starch.”
5. Using a clean pipette, add 1.0 mL of glucose solution to the test tube labeled “glucose.”
6. Using a clean pipette, add 1.0 mL of distilled water to the test tube labeled “water.”
7. Add 10 drops of Benedict’s solution to each of the test tubes.
8. Place each of the test tubes in the hot water bath for three minutes.
9. After three minutes, remove each test tube from the hot water bath using the test tube tongs. Place each test tube back into the test tube rack.
10. Record your observations in the data table below.
11. Dispose of the solutions by flushing them down the drain with copious amounts of water.
12. Use a test tube brush and soapy water to clean the five test tubes and rinse with clean water. Use a paper towel to dry the test tubes as best you can.

***Data Table***

Indicate a positive test result by placing a “+” in the appropriate box.   
Indicate a negative test result by placing a “-“ in the appropriate box.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Test Tube #1:**  **Oil** | **Test Tube #2:**  **Protein** | **Test Tube #3:**  **Starch** | **Test Tube #4:**  **Glucose** | **Test Tube #5: Water** |
| **Part A:  Biuret’s Reagent** |  |  |  |  |  |
| **Part B:**  **Paper Towel** |  |  |  |  |  |
| **Part C:**  **Lugol’s Iodine** |  |  |  |  |  |
| **Part D:**  **Benedict’s Solution** |  |  |  |  |  |

***Analysis Questions***

1. Which test is used to indicate the presence of a lipid? What color change occurs with the indicator? Which test substance contained lipids?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Which test is used to indicate the presence of a protein? What color change occurs with the indicator? Which test substance contained proteins?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Which test is used to indicate the presence of a complex carbohydrate? What color change occurs with the indicator? Which test substance contained complex carbohydrates?   
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Which test is used to indicate the presence of a simple carbohydrate? What color change occurs with the indicator? Which test substance contained simple carbohydrates?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Why was water used in each test?  
   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Conclusion***

Write a conclusion to this lab by answering each of the prompts below. Remember to use complete sentences with correct spelling, grammar, and punctuation. You may choose to type and email your conclusion to your teacher.

* Restate the purpose of the lab in past tense.
* Briefly describe the procedure used to test for the presence of each of the biomolecules.
* Describe the biological function of each of the biomolecules tested in this lab
* Describe at least one source of error encountered in the lab, how it affected your results, and how it could be corrected
* What did you learn by completing this lab investigation?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Activity: Chemistry of Carbohydrates, Lipids, & Proteins Period: \_\_\_Date:\_\_\_/\_\_\_/\_\_\_\_\_\_

**Objective 1:** Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of organisms.

Read through each section and answer the following questions

**Organic molecules** are the molecules which exist in all living things. They are life’s building blocks. All things are formed from these organic molecules. There are four categories of organic molecules: Carbohydrates, lipids, proteins and nucleic acids.

**1. How are organic molecules related to all living things?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2. Name four categories of organic molecules which form the basis of all living things:**

**a. \_\_\_\_\_\_\_\_\_\_\_\_\_ b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ d. \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Organic molecules have four common characteristics. First, they are all carbon based, meaning they all contain carbon. Secondly, they are formed from just a few elements which join together to form small molecules which join together, or bond, to form large molecules. The third characteristic of all organic molecules is that each is kind of organic molecule is built from a single type of building block. For example, the building block of carbohydrates is sugar, the building block of lipids is fatty acids, the building block of protein is amino acids and the building block of nucleic acids is the nucleotide. When these building blocks are joined together, they form a large molecule (polymer), just as bricks joined together form a wall. For example, sugars join together form a carbohydrate.

**3. All of the organic molecules are based on which element?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4. Many times, the molecules join to form long chains with what kind of backbone**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5. How are the building blocks of organic molecules like bricks?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**6. What is the building block of each of the four classes of organic molecules?**

**a. The building blocks of carbohydrates are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**b. The building blocks of lipids are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**c. The building blocks of proteins are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**d. The building blocks of nucleic acids are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**7. What is a polymer?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The last common characteristic of all organic molecules is that their form determines their function. That means that their shape determines how they will behave and how they will react with other molecules. For example, the order of amino acids in a protein will determine the shape and function of the protein just as the order of words in a sentence shapes the meaning of the sentence.

**8. What determines how organic molecules will look and behave?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**9. What are the four common characteristics of all organic molecules?**

a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Carbohydrates**

Carbohydrates are the most common organic molecule because they make up most plant matter. They are made from carbon, hydrogen and oxygen. Their building block, a single sugar, is called a monosaccharide. Sugars (monosaccharides) consist of carbon rings. When two monosaccharides, or sugars, combine, they form a disaccharide (di = two). When more than two monosaccharides join together, a polysaccharide (poly = many) is formed.

**10. What are the elements contained in carbohydrates?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**11. What is the building block of carbohydrates? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**12. What is a monosaccharide? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**a. What does a monosaccharide look like?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**13. What is a disaccharide?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**14. How does a polysaccharide differ from a disaccharide?**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

There are three classes of carbohydrate polysaccharides. The first is starch. Starch is a carbohydrate used in food storage in plants. Potatoes, pasta and rice are rich in starch. Starches are very valuable because they provide a quick form of energy for the body. The second is glycogen. Glycogen is used for food storage in animals. The third is cellulose. Cellulose is used for structural support in plants (stems, leaves).

**15. What are the three classes of carbohydrates?**

a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**16. Which involves food storage in plants?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**17. Which involves food storage in animals?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**18. What is cellulose used for?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**19. Why would an athlete have a big pasta dinner the night before a race?**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lipids**

Lipids are a class of organic molecules which includes fats and oils, and has the function of long-term storage of energy in the body. The building block of lipids is the fatty acid, which is a chain of carbons with hydrogen attached to each side. The “head” of Saturated fats have two carbons attached to each carbon (except the one at the end), are unhealthy fats usually from animal sources, and solid at room temperature. Unsaturated fats are missing at least one hydrogen, are kinked in shape, are healthy and from plant sources, and liquid at room temperature.

**20. What is the building block of lipids?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**21. Name two specific examples of lipids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**22. Describe the structure of a fatty acid: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**23. What is a saturated fatty acid? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**Proteins**

Proteins are organic molecules that form muscles, transport O2 (hemoglobin), and act as hormones and enzymes. Most importantly, proteins determine how our bodies look and function. Their building block is the amino acid. Proteins are made of amino acids linked by a peptide bond. When groups of amino acids are joined together, a protein is formed.

**24. What are some of the functions of proteins? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**25. What is the building block of proteins? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**26. What is the name of the bond that joins amino acids? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

There are about 20 different kinds of amino acids. These amino acids consist of five separate parts: a central carbon atom, a carboxyl group (-COOH), an amino group (-NH2), a hydrogen, and a „R‟ group. The only difference in the 20 kinds of amino acids is the “R” group. Some “R” groups are very small, others are large, and others form chains and rings. The sequence and shapes of the “R” groups control the shape and function of the protein.

**27. How many different amino acids are there? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**28. What part of the amino acid varies from one amino acid to another? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**29. What determines the shape and function of a protein? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**Nucleic Acids**

The fourth class of organic molecules is the nucleic acids. This class involves the genetic materials, DNA and RNA. DNA is the blueprint of life because it contains instructions on how to make proteins in the body. Each individual‟s DNA is unique, which means that each individual has a unique set of proteins; that is why each of us looks and behaves differently. RNA creates a copy of DNA because DNA can‟t leave the cell‟s nucleus, and because proteins are constructed outside of the nucleus in the cytoplasm -- the RNA is necessary to carry the instructions from DNA to the cytoplasm where the protein is made.

**30. What are the two types of nucleic acids? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**31. What is the role of DNA? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**32. How does the role of RNA differ from that of DNA? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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The monomer of nucleic acids is the nucleotide. All nucleic acids are formed from a series of these nucleotides. Nucleotides consist of three parts: a five-carbon sugar, a phosphate group and a nitrogen base.

**33. What is the building block of nucleic acids? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**34. What are the three parts of this monomer?**

**a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Draw a line to match the right with the left**

Fatty acids & glycerol protein

Monosaccharide lipid

Nucleotide nucleic acid

Amino acid carbohydrate

Fatty acids & glycerol polysaccharide

Monosaccharide RNA

Nucleotide enzyme

Amino acid phospholipid

Fatty acids & glycerol enzyme

Glucose triglyceride

Nucleotide starch

Amino acid DNA

Amino acid glycogen

Nucleotide phospholipid

Monosaccharide protein collagen

Fatty acids & glycerol DNA

**Fill in the Charts below**

|  |  |
| --- | --- |
| **MACROMOLECULES** | **GIVE SOME FUNCTIONS OF EACH** |
| **CARBOHYDRATES** | **1.**  **2.**  **3.**  **4.** |
| **NUCLEIC ACIDS** | **1.**  **2.**  **3.** |
| **LIPIDS** | **1.**  **2.**  **3.** |
| **PROTEINS** | **1.**  **2.**  **3.**  **4.**  **5.** |

**Match the molecule with its description:**

**LIPIDS CARBOHYDRATES PROTEINS NUCLEIC ACIDS**

|  |  |
| --- | --- |
|  | **made by joining amino acid subunits in long chains which provide a wide variety of functions in cells** |
|  | **made from carbon, hydrogen, and oxygen atoms in 1:2:1 ratio** |
|  | **Protein hormone that tells animal cells to store blood glucose as glycogen** |
|  | **Macromolecule with a polar glycerol/phosphate “head” and 2 non-polar hydrophobic “tails” used to make cell membranes** |
|  | **Storage form of starch used by plant cells** |
|  | **Hydrophobic fats, oils, waxes, & steroids made mainly from carbon and hydrogen atoms in long chains or multiple rings** |
|  | **Structural polysaccharide made from glucose subunits that makes plants sturdy** |
|  | **Membrane structure made of amino acids that helps cells identify “self” and plays a role in blood types, organ transplants, and germ recognition** |
|  | **Nucleotide subunit made from ribose sugar, adenine, and 3 phosphates which stores and transports ENERGY in cells** |
|  | **Storage form of glucose used by animal cells** |
|  | **Protein found in red blood cells that carries oxygen to the body** |
|  | **Largest biomolecule in an organism used in storing genetic information in the nucleus of a cell** |
|  | **Fatty substance used in warming an organism and padding their joints and organs.** |
|  | **Enzymes used to speed up cellular reactions** |

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.1.1 Concept Map: Biochemistry (free-draw) Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

*Goal:* To create a complete concept map for the BioChemistry Unit that accurately demonstrates how key vocabulary are related to one another.

*Instructions:*

1. Read through all of the words that you must use in your concept map. Think of a meaningful theme that includes all of these concepts and place that at the top of your concept map.
2. Using colored pencils, crayons, or hi-lighters, subdivide the list into two or more sub-categories, color-coding each list.
3. Link words within each group in meaningful ways using arrows and meaningful linking words or phrases.
4. Link each subgroup, or terms within each subgroup, in meaningful ways, again using arrows and linking words or phrases.
5. If you would like to complete your concept map on an 11x17 sheet of paper, please ask your instructor to procure one for you.

*Biochemistry Vocabulary List:*

* Activation Energy
* Active site
* Amino Acid
* Biomolecules
* Carbohydrates
* Carbon
* Catalyst
* Cellulose
* Denature
* DNA
* Enzymes
* Enzyme-Substrate Complex
* Fats
* Glucose
* Glycerol + fatty acids
* Hydrogen bonds
* Immunity
* Lactase
* Lipid
* Long-term energy storage
* Monomer
* Monosaccharide
* Movement
* Nucleic Acid
* Nucleotides
* Oils
* Peptide bonds
* Polymer
* Polypeptide
* Protein
* RNA
* Specificity
* Starch
* Store & transfer genetic messages for protein production
* Structure
* Sugar
* Temperature & pH
* Useable energy
* Waxes

Biology I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.1.1 Concept Map: Biochemistry (cut-out) Period: \_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

*Goal:* To create a complete concept map for the BioChemistry Unit that accurately demonstrates how key vocabulary are related to one another.

*Instructions:*

1. Read through all of the words that you must use in your concept map. Think of a meaningful theme that includes all of these concepts and place that at the top of your concept map.
2. Using colored pencils, crayons, or hi-lighters, subdivide the list into two or more sub-categories, color-coding each list.
3. Link words within each group in meaningful ways using arrows and meaningful linking words or phrases.
4. Link each subgroup, or terms within each subgroup, in meaningful ways, again using arrows and linking words or phrases.
5. Glue your final concept map to a blank sheet of 11x17 paper (or take a picture and text it to your instructor).

*Biochemistry Vocabulary List:*

Cut out each of the following vocabulary terms and phrases and use them to construct your concept map

|  |  |
| --- | --- |
| Activation Energy | Monomer |
| Active site | Monosaccharide |
| Amino Acid | Movement |
| Biomolecules | Nucleic Acid |
| Carbohydrates | Nucleotides |
| Carbon | Oils |
| Catalyst | Peptide bonds |
| Cellulose | Polymer |
| Denature | Polypeptide |
| DNA | Protein |
| Enzymes | RNA |
| Enzyme-Substrate Complex | Specificity |
| Fats | Starch |
| Glucose | Store & transfer genetic messages for protein production |
| Glycerol + fatty acids | Structure |
| Hydrogen bonds | Sugar |
| Immunity | Temperature & pH |
| Lactase | Useable energy |
| Lipid | Waxes |
| Long-term energy storage |  |